

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
24 December 2003 (24.12.2003)

PCT

(10) International Publication Number  
**WO 2003/106993 A3**

(51) International Patent Classification<sup>7</sup>: **G01N 29/10,**  
**G01B 17/00**

(21) International Application Number:  
**PCT/US2003/019133**

(22) International Filing Date: 17 June 2003 (17.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/389,394 17 June 2002 (17.06.2002) US

(71) Applicant (for all designated States except US):  
**SWAGELOK COMPANY** [US/US]; 2950 Solon Road,  
Solon, OH 44139 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **ALES, Richard, A.**  
[US/US]; 6455 Southgrove Road, Mentor, OH 44060 (US).  
**GLIME, William, H.** [US/US]; 1296 Bowdin, Painesville,  
OH 44077 (US). **HULL, John, Barry** [GB/GB]; Lea Cot-  
tage, Melton Road, Hichkling Pastures, Melton Mowbray,

Leicestershire LE14 2QG (GB). **RUBINSKI, Jeffrey, M.**  
[US/US]; 2214 Buena Vista Drive, Wickliffe, OH 44092  
(US). **SEYMOUR, Michael, Douglas** [GB/GB]; Pear Tree  
Lodge, 2A Scrimshire Lane, Cotgrave, Nottinghamshire  
NG12 3JD (GB). **WILLIAMS, Peter, C.** [US/US]; 3495  
Edison Road, Cleveland Heights, OH 44121 (US). **YANG,**  
**Wenxian** [GB/GB]; 59A Montpelier Road, Dunkirk, Not-  
tinghamshire NG7 2JY (GB).

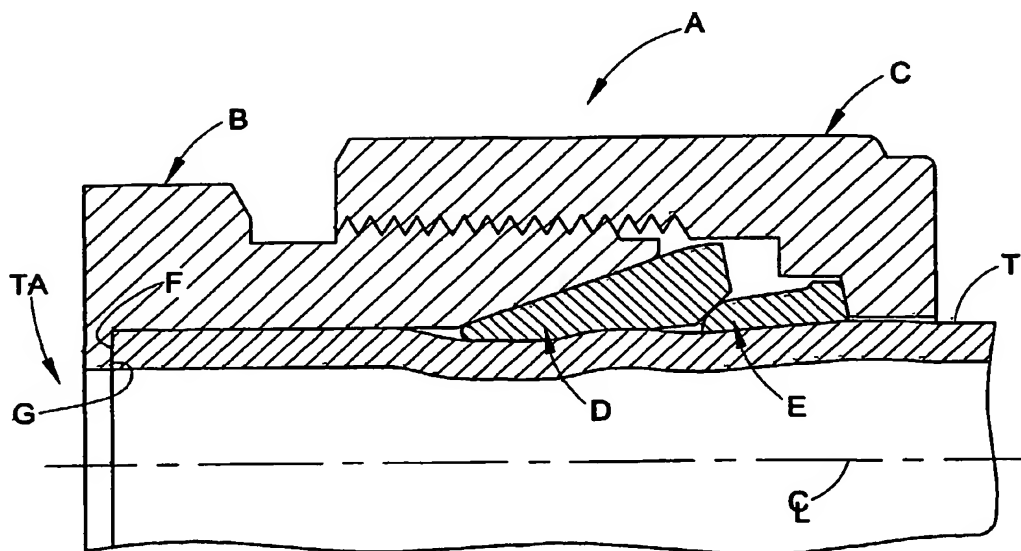
(74) Agent: **MCKNIGHT, Douglas, B.**; Calfee, Halter & Gris-  
wold LLP, 800 Superior Avenue, Cleveland, OH 44114  
(US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,  
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,  
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,  
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,  
SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,  
VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),

[Continued on next page]

(54) Title: ULTRASONIC TESTING OF FITTING ASSEMBLY FOR FLUID CONDUITS WITH A HAND-HELD APPARATUS



(57) Abstract: Hand-held apparatus and method for determining relative and/or absolute axial position of a conduit end within a fluid coupling includes application of input ultrasonic energy in the form of transient shear waves and analyzing the reflected energy. Application of the input energy collected at different radial positions about a first axial location is used with wavelet based correlation techniques to better analyze the reflected energy signals. Quality of the abutment between the conduit end and a surface associated with the coupling may also be determined as a separate or combined feature of the axial position determination.



European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

**Declaration under Rule 4.17:**

— *of inventorship (Rule 4.17(iv)) for US only*

**(88) Date of publication of the international search report:**

23 September 2004

**Published:**

— *with international search report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 2004/019133

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G01N29/10 G01B17/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01N G01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6 360 609 B1 (WOOH SHI-CHANG) 26 March 2002 (2002-03-26)	1,5-13
A	abstract; figures 1A,11 column 1, line 13 - column 8, line 41	2-4
Y	WO 99/31499 A (TRICORN GROUP PLC ; MECON LIMITED (GB); GORMAN MICHAEL (GB); HARPER MA) 24 June 1999 (1999-06-24)	1,5-13
A	abstract; claim 11; figures 1-3,5 page 1, paragraph 1 - page 9, paragraph 1	2-4
Y	US 3 218 845 A (WORLTON DANIEL C) 23 November 1965 (1965-11-23)	1,5-13
A	the whole document	2-4
	----- -/-	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the International filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&amp;" document member of the same patent family

Date of the actual completion of the international search

5 July 2004

Date of mailing of the international search report

14/07/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Uttenthaler, E

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 19133

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DEUTSCH V ET AL: "3.2 Ultraschallprüfgeräte" ULTRASCHALLPRUEFUNG: GRUNDLAGEN UND INDUSTRIELLE ANWENDUNGEN, 1997, pages 55-73, XP002279058 BERLIN HEIDELBERG NEW YORK	1,5-13
A	page 70, last paragraph; figure 3.34	2-4
Y	SADOWSKY J: "Investigation of signal characteristics using the continuous wavelet transform" JOHNS HOPKINS APL TECH. DIG. (USA), JOHNS HOPKINS APL TECHNICAL DIGEST, JULY-SEPT. 1996, JOHNS HOPKINS UNIV. APPL. PHYS. LAB, USA, vol. 17, no. 3, July 1996 (1996-07), pages 258-269, XP009032917 ISSN: 0270-5214 the whole document	8
A	US 3 287 813 A (ZAHURANEC EMERY J ET AL) 29 November 1966 (1966-11-29) cited in the application the whole document	2-4

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 9133

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6360609	B1	26-03-2002	WO 0163276 A1	30-08-2001
WO 9931499	A	24-06-1999	GB 2332274 A	16-06-1999
			AU 735710 B2	12-07-2001
			AU 1497199 A	05-07-1999
			CA 2312394 A1	24-06-1999
			EP 1038175 A1	27-09-2000
			WO 9931499 A1	24-06-1999
			US 6474165 B1	05-11-2002
US 3218845	A	23-11-1965	NONE	
US 3287813	A	29-11-1966	NONE	